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10/647,247	08/26/2003	Hajime Yamamoto	031029	1773

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EXAMINER	
CHACKO DAVIS, DABORAH	
ART UNIT	PAPER NUMBER
1722	

NOTIFICATION DATE	DELIVERY MODE
09/15/2011	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentmail@whda.com

Office Action Summary	Application No.	Applicant(s)	
	10/647,247	YAMAMOTO ET AL.	
	Examiner	Art Unit	
	DABORAH CHACKO DAVIS	1722	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 June 2011*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *1,3,5-11,14-19 and 21-26* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☒ Claim(s) *26* is/are allowed.

7)☒ Claim(s) *1,3,5-8,10,11,14-19 and 21-25* is/are rejected.

8)☒ Claim(s) *9* is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

12)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 3, 5-6, 8, 10-11, 14-15, 18-19, and 21-24, are rejected under 35 U.S.C. 103(a) as being unpatentable over EP 1152036 (Kanda et al., hereinafter referred to as Kanda) in view of U. S. Patent Application Publication No. 2002/0012035 (Mouri et al., hereinafter referred to as Mouri).

Kanda, in the abstract, in [0001], [0022], [0023], [0024], [0025], [0026], [0034], [0035], and in Table I, discloses forming a semiconductor device by forming a resist pattern on the substrate, coating the resist pattern with a resin composition (the claimed forming the resist pattern smoothing material) and subjecting the coated resist pattern to a heat treatment, wherein the thickness of the resin coated onto the resist pattern and the heat treatment is adjusted (suitably determined), followed by developing the coating layer (smoothing layer) resulting in the smoothed resist pattern (resist pattern with smooth side walls, wall surfaces etc). Kanda, in [0024], lines 57-58, and on page 5, lines 1, discloses that the water-soluble resin-coated resist pattern is exposed and developed and heated to at least 85°C, i.e., it will inherently cause the resist walls to smooth forming a smooth resist pattern. Kanda, in [0032], discloses that the resist layer forms a resist opening (hole in positive resist) that corresponds to the exposure

performed (claims 1, 21). Kanda in [0031], [0032], [0033], [0034], [0035], [0036], [0037], and in Table 1, discloses that the resist patterns formed are without fish eyes or striations at all, i.e., the average opening dimension is greater than 90% of the predetermined opening dimension, and Table I (indicating the characteristics) of Kanda reveals that the maximum and minimum opening dimensions (resist openings that are smoothed, without striations and are uniform) are within a range of ±3% of the predetermined opening dimension. Kanda, in [0023], discloses that the resist is an ArF resist (claims 3, 5, 6, 22, 23, and 24). Kanda, in [0023], discloses that the coating layer is heated in the claimed range (80 - 100°C) (claim 8). Kanda, in [0006], and [0007], discloses that the water-soluble resin composition (coating layer) includes a resin, a surface-active agent, and a crosslinking agent, and is water-soluble (claims 10-11). Kanda, in [0016], discloses that the surfactant is a non-ionic surfactant such as an alkoxylate compound (ethoxylate compound) or alcohols. Kanda, in [0009], and [0011], discloses that the resin is a polyvinyl alcohol, the crosslinking agent is a melamine derivative, and the claimed resin (Claims 14-15). Kanda, in [0019], discloses that the organic solvent is an alcohol solvent (claims 18-19).

The difference between the claims and Kanda is that Kanda does not disclose that the surface active agent (surfactant) is one recited in claim 1.

Mouri, in paragraph nos. [0109] through [0112], discloses that a coating layer composition includes a water-soluble resin includes a cationic surfactant, and amphoteric surfactants.

Therefore, it would be obvious to a skilled artisan to modify Kanda by employing cationic and/or amphoteric surfactants as suggested by Mouri in the resin composition because Kanda, in [0016], discloses that the resist pattern smoothing material comprise a surface active agent (surfactant) and in [0022], and [0024], discloses that using the water-soluble resin composition that comprises the surfactant, enables the coating of the already formed resist pattern and using the coated resist pattern to form a trench pattern of a hole pattern that is fine.

3. Claims 7, and 25, are rejected under 35 U.S.C. 103(a) as being unpatentable over EP 1152036 (Kanda et al., hereinafter referred to as Kanda) in view of U. S. Patent Application Publication No. 2002/0012035 (Mouri et al., hereinafter referred to as Mouri) as applied to claims 1, 3, 5-6, 8-11, 14-15,18-19, and 21-24, above, and further in view of U. S. Patent No. 6,043,145 (Suzuki et al., hereinafter referred to as Suzuki).

Kanda in view of Mouri is discussed in paragraph no. 2.

The difference between the claim and Kanda in view of Mouri is that Kanda in view of Mouri does not disclose that the smoothed resist pattern has an opening dimension within the range of 50nm to 150nm (claims 7, and 25).

Suzuki, in col 4, lines 38-45, discloses that the resist pattern dimensions are increasingly narrowed such that the width (opening dimension of a pattern) of the pattern is 0.15μ (i.e., 150nm).

Therefore, it would be obvious to a skilled artisan to modify Kanda in view of Mouri by employing the opening dimension (width) suggested by Suzuki because Kanda, in [0036], discloses that the resist pattern width (opening of the LSI's) is reduced

and smoothed and in [0002], and [0039], discloses that the LSI fabricated in the claimed method would possess reduced spaces (width) in the trenches or holes due to the thickening of the resist.

4. Claims 16-17, are rejected under 35 U.S.C. 103(a) as being unpatentable over EP 1152036 (Kanda et al., hereinafter referred to as Kanda) in view of U. S. Patent Application Publication No. 2002/0012035 (Mouri et al., hereinafter referred to as Mouri) as applied to claims 1, 3, 5-6, 8-11, 14-15,18-19, 21-24, above, and further in view of U. S. Patent No. 6,537,719 (Takahashi) and U. S. Patent No. 6,555,617 (Tanaka et al., hereinafter referred to as Tanaka).

Kanda in view of Mouri is discussed in paragraph no. 2.

The difference between the claims and Kanda in view of Mouri is that Kanda in view of Mouri does not disclose that the resist pattern smoothing material (resin composition) comprises one of a water-soluble aromatic compound and resin having an aromatic compound (claim 16). Kanda in view of Mouri does not disclose the water-soluble aromatic compound recited in claim 17, and does not disclose the resin aromatic compound recited in claim 17.

Takahashi, in col 6, lines 11-42, discloses that the alkali-soluble photosensitive composition (resin) can be aromatic and that the composition includes an aromatic compound such as alcohol derivatives of naphthalene (naphthol).

The difference between the claims and Kanda in view of Mouri further in view of Takahashi is that Kanda in view of Mouri further in view of Takahashi does not disclose the claimed resin containing an aromatic compound.

Tanaka, in col 3, lines 16-64, discloses that the resin composition includes a polyvinyl aryl acetal resin (resin containing an aromatic compound).

Therefore, it would be obvious to modify Kanda in view of Mouri by employing the aromatic compound suggested by Takahashi because Takahashi, in col 4, lines 8-16, in col 5, lines 7-20, and in col 6, lines 11-40, and in col 12, lines 40-47, discloses that employing the suggested aromatic phenolic resin is preferable for the formation of a radiation sensitive resin composition so as to enable combination with a fluorescent material without impairing the characteristics of the resist. It would be obvious to a skilled artisan to modify Kanda in view of Mouri further in view of Takahashi by employing the resin containing the aromatic compound because Kanda in [0009], discloses that the resin composition includes a polyvinyl acetal resin, and Tanaka, in col 3, lines 35-56, and in col 5, lines 34-36, and in col 6, lines 38-43, discloses that the resin composition that includes the polyvinyl acetal resin is modified by including an aryl group in the polyvinyl acetal structural unit, and doing so improves the glass transition temperature and heat resistance of the modified coating resin, and that the modified polyvinyl acetal aryl resin is applicable as a coating material due to its adhesiveness and film-forming properties.

Allowable Subject Matter

5. Claim 9 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

6. Claim 26 is allowable over the prior art of record (EP 1152036 (Kanda et al., hereinafter referred to as Kanda), U. S. Patent Application Publication No. 2002/0012035 (Mouri et al., hereinafter referred to as Mouri), U. S. Patent No. 6,537,719 (Takahashi) and U. S. Patent No. 6,555,617 (Tanaka et al., hereinafter referred to as Tanaka)) because the prior art of record does not disclose that the application thickness of the resist pattern smoothing material is adjusted in the range of 70nm to 90nm in thickness.

Response to Arguments

7. Applicant's amendment and arguments, filed on January 7, 2011, with respect to the 35 U.S.C. 112, first paragraph rejection of claims 1, 3, 5-11, 14-19, and 21-26, have been considered, and the 35 U.S.C.112, first paragraph rejection has been withdrawn. The Double Patenting rejection of claims 1, 3, 5-11,14-19, and 21-26, has been withdrawn. See Terminal Disclaimer Review decision mailed 08/30/2011. As stated in the previous office action (non-final rejection of April 1, 2011) i.e., "Upon clarification of the subject matter in claims 1, and 21, or removal of the newly added subject matter in claims 1, and 21, the rejections made in the previous office action (mailed October 12, 2010), of claims 1,3,5-11,14-19, and 21-26, will be reinstated". Therefore, the rejection made over claims 1, 3, 5-8, 10-11, 14-19, and 21-25, in the office action mailed October 12, 2010, has been re-instated.

A) Applicants argue that Kanda does not disclose the claimed opening dimension, and that the reduction of the space in the resist pattern is larger than the claimed amount.

Kanda in [0031], [0032], [0033], [0034], [0035], [0036], [0037], and in Table 1, discloses that the resist patterns formed are without fish eyes or striations at all, i.e., the average opening dimension is greater than 90% of the predetermined opening dimension, and Table I (indicating the characteristics) of Kanda reveals that the maximum and minimum opening dimensions are within a range of ±3% of the predetermined opening dimension (see paragraph no. [0035]). Kanda in paragraph nos. [0025], [0026], [0027], [0028], discusses that the resist pattern that is coated with the water-soluble resin composition is heated and crosslinked, and the non-crosslinked portions of coated water-soluble resin (resist pattern smoothening material) are removed, and not the previously formed resist pattern (resist pattern without the water-soluble resin coated onto its surface), and that only portions of the coated water-soluble resin that are crosslinked with the resist pattern remain. And as disclosed by Kanda (in the preceding sentence) the range of maximum to minimum in the opening dimension is within ±3%. The instant claim 1, recites a resist pattern, and the formation of a resist pattern smoothing material on the formed resist pattern, and that at least one of an application thickness of the resist pattern smoothing material and heat temperature for the heating is adjusted so as to smooth at least the wall surfaces of the resist pattern. Kanda teaches a resist pattern and forming a coating layer (the claimed resist pattern smoothing material) on the resist pattern and heating the coating material coated resist pattern i.e., the heating process will cause the surface of the coated resist pattern to smooth the walls of the resist pattern such that there are no striations i.e., the smoothed resist pattern will have the claimed opening dimensions, and as discussed in Kanda in

paragraph no. [0038], the resist pattern and the gaps between the resist pattern will be made accurately. Therefore, Kanda's coated (smoothed resist pattern) resist pattern is reduced in size by the claimed amount.

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daborah Chacko-Davis whose telephone number is (571) 272-1380. The examiner can normally be reached on M-F 9:30 - 6:00. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia H. Kelly can be reached on (571) 272-1526. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/DABORAH CHACKO-DAVIS/
Primary Examiner, Art Unit 1722

September 11, 2011.